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Computer-assisted versus oral-and-written dietary history taking for diabetes mellitus (Review)

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Cochrane Database of Systematic Reviews 2011, Issue 12. Art. No.: CD008488.

DOI: 10.1002/14651858.CD008488.pub2.

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Computer-assisted versus oral-and-written dietary history taking for diabetes mellitus

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Editorial group: Cochrane Metabolic and Endocrine Disorders Group.

Publication status and date: New, published in Issue 12, 2011.

Review content assessed as up-to-date: 9 June 2011.

Citation: Wei I, Pappas Y, Car J, Sheikh A, Majeed A. Computer-assisted versus oral-and-written dietary history taking for diabetes mellitus. *Cochrane Database of Systematic Reviews* 2011, Issue 12. Art. No.: CD008488. DOI: 10.1002/14651858.CD008488.pub2.

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ABSTRACT

Background

Diabetes is a chronic illness characterised by insulin resistance or deficiency, resulting in elevated glycosylated haemoglobin A1c (HbA1c) levels. Diet and adherence to dietary advice is associated with lower HbA1c levels and control of disease. Dietary history may be an effective clinical tool for diabetes management and has traditionally been taken by oral-and-written methods, although it can also be collected using computer-assisted history taking systems (CAHTS). Although CAHTS were first described in the 1960s, there remains uncertainty about the impact of these methods on dietary history collection, clinical care and patient outcomes such as quality of life.

Objectives

To assess the effects of computer-assisted versus oral-and-written dietary history taking on patient outcomes for diabetes mellitus.

Search methods

We searched *The Cochrane Library* (issue 6, 2011), MEDLINE (January 1985 to June 2011), EMBASE (January 1980 to June 2011) and CINAHL (January 1981 to June 2011). Reference lists of obtained articles were also pursued further and no limits were imposed on languages and publication status.

Selection criteria

Randomised controlled trials of computer-assisted versus oral-and-written history taking in patients with diabetes mellitus.

Data collection and analysis

Two authors independently scanned the title and abstract of retrieved articles. Potentially relevant articles were investigated as full text. Studies that met the inclusion criteria were abstracted for relevant population and intervention characteristics with any disagreements resolved by discussion, or by a third party. Risk of bias was similarly assessed independently.

Main results

Of the 2991 studies retrieved, only one study with 38 study participants compared the two methods of history taking over a total of eight weeks. The authors found that as patients became increasingly familiar with using CAHTS, the correlation between patients' food records and computer assessments improved. Reported fat intake decreased in the control group and increased when queried by the computer. The effect of the intervention on the management of diabetes mellitus and blood glucose levels was not reported. Risk of bias was considered moderate for this study.

Authors' conclusions

Based on one small study judged to be of moderate risk of bias, we tentatively conclude that CAHTS may be well received by study participants and potentially offer time saving in practice. However, more robust studies with larger sample sizes are needed to confirm these. We cannot draw on any conclusions in relation to any other clinical outcomes at this stage.

PLAIN LANGUAGE SUMMARY

Computer-assisted versus oral-and-written dietary history taking for diabetes mellitus

People with diabetes need to adjust their diet in order to control their blood sugar levels and avoid complications. Healthcare professionals often take dietary histories from patients to help them monitor their dietary intake and provide them with advice. Patient histories may be recorded manually by using oral-and-written methods or via a computer-assisted history taking system. Computer-assisted history taking systems can be used by healthcare professionals, or directly by patients, as in the case of, for example, pre-consultation interviews. They can be used remotely, for example via the Internet, telephone or on-site. They draw on a range of technologies such as personal computers, personal digital assistants, mobile phones and electronic kiosks; data input can be mediated via, amongst others, keyboards, touch screens and voice-recognition software. Although computer-assisted history taking methods were first used in the 1960s we are still not certain about their effects on dietary history taking in people with diabetes. Therefore, we reviewed the literature to find studies that compare the effects of oral-and-written to those of computer-assisted dietary history taking on the quality of collected data as well as on the quality of patients' lives. We found only one publication with 38 study participants that compared the two methods of history taking over a total of eight weeks. This study found that computer-assisted diet history taking would be as accurate as the oral-and-written method and may potentially allow doctors to spend more time with their patients to discuss as opposed to taking measurements. However, it is not possible to draw reliable conclusions of which of the two methods is more effective from a single small study. We therefore suggest that more primary research is required in this area to allow an informed decision to be made by physicians, patients and policymakers.

BACKGROUND

Description of the condition

Diabetes mellitus, henceforth referred to as diabetes, is a metabolic disorder resulting from a defect in insulin secretion, insulin action, or both. A consequence of this is chronic hyperglycaemia (elevated levels of plasma glucose) with disturbances of carbohydrate, fat and protein metabolism. Long-term complications of diabetes mellitus include retinopathy, nephropathy and neuropathy. The risk of cardiovascular, cerebro-vascular and peripheral vascular diseases as well as some other conditions is increased. For a detailed overview

of diabetes mellitus, please see under 'Additional information' in the information on the Metabolic and Endocrine Disorders Group in *The Cochrane Library* (see 'About', 'Cochrane Review Groups (CRGs)'). For an explanation of methodological terms, see the main glossary in *The Cochrane Library*.

The World Health Organization's (WHO) latest projections are that diabetes is expected to become one of the world's leading causes of morbidity and mortality within the next 25 years (WHO 2002). The prevalence of diagnosed diabetes for adults worldwide was estimated to be 6.4% with the total number of affected adults standing at 285 million in 2010. It was also estimated that the number of adults diagnosed with diabetes will increase dramatically (as a consequence of population aging, rising levels of obe-

sity, dietary changes and urbanisation) reaching 439 million in 2030, representing more than 7.7% of the world's adult population (Shaw 2010).

Diabetes is a very costly disease for healthcare systems. Direct healthcare costs of diabetes range from 2.5% to 15% of annual healthcare budgets, depending on local diabetes prevalence and the sophistication of the treatments available (WHO 2002).

Given the substantial morbidity and mortality associated with diabetes, it is important that we seek ways to gather data to manage patients effectively. Diet is an important factor that can have a major effect on the course of diabetes. Adherence to dietary advice has, for example, been shown to be associated with lower glycosylated haemoglobin A1c (HbA1c) levels and better control of disease (Delahanty 1993; Delahanty 2009). The dietary history may therefore be a useful clinical and public health tool for effective diabetes management. The dietary history in patients with diabetes has traditionally been taken by oral-and-written methods (or variants of this), but it can also be undertaken using computer-assisted methods (discussed below).

Description of the intervention

Computer-assisted history taking systems (CAHTS) are tools that aim to aid physicians in gathering data from patients to inform a diagnosis, a treatment plan or both (Pringle 1998). CAHTS can be used by healthcare professionals, or directly by patients, as in the case of pre- or post-consultation interviews (Bachman 2003; Healthspace 2009; RelayHealth 2009). CAHTS can be used remotely, for example via the Internet, telephone or mobile phone messaging or on-site (Appendix 1).

Bowling 2005 describes that the various CAHTS typologies depend on three interrelated factors:

1. the information technology used to collect the information (e.g. personal computer, personal digital assistant, or telephone);
2. the mode of administration (e.g. administered by an interviewer or self-administered);
3. the channel of presentation (e.g. auditory, oral or visual).

Many of these computer-assisted methods are now supported via the use of the Internet. CAHTS draw on a range of technologies such as personal computers, personal digital assistants, electronic kiosks etc. and data input happen via keyboard, touch-screen, voice-recognition software among others.

With the addition of diagnostic and reminder functionalities, CAHTS may influence all stages of the patient care pathway before, during and after the consultation. For example, with the addition of a diagnostic platform such as probabilistic advice and question-prompting, CAHTS may become instrumental in the decision-making process.

Although CAHTS were first described in the 1960s, there is still uncertainty about the impact of these methods on dietary history data collection, clinical care and patient outcomes such as quality of life.

Adverse effects of the intervention

CAHTS may however also cause inconvenience to patients and physicians (Dale 2007), and they may also raise fears about possible breaches of privacy and confidentiality (Bowling 2005). The use of self-administered CAHTS may possibly also lead to undetected psychosocial concerns because of reduced contact between the patient and the physician.

How the intervention might work

CAHTS can facilitate automations of some history taking approaches, thereby potentially aiding the collection of data in a timely manner. CAHTS can further be administered at a time that is convenient to the patient and physician and save time and costs (Benaroya 2007; Wolford 2008). Additionally, they can promote standardisation of data collection and compatibility with electronic health record templates (Llewelyn 2005). This also offers the benefit that any data collected can then be potentially linked to a computerised decision support system and the patient offered personalised feedback on their dietary intake and how to modify this to reduce their risk of developing complications. Individually, patients may benefit from greater awareness of recording their dietary intake and the impact of this on HbA1c. Patients who might benefit from further intervention can also be identified.

Physician and patient-operated CAHTS data are thus potentially important additions to the electronic health record as they can help to improve data quality through:

- data entry forms with data validation checks;
- encoding of data;
- legibility;
- easier access to past records;
- attribution of entries;
- greater availability;
- facilitating patient checks of their own data.

Patient-completed diaries online allow information on dietary and self-generated data (for example, blood glucose or urine analysis) to be made available to physicians without the need for a face-to-face encounter.

Collected data from gathered histories can also generate data sets that facilitate epidemiological research using patient level data (Bachman 2003). Also of note is that some studies have suggested that CAHTS may substantially reduce the time spent on dictating and collating written records while being able to present relevant data in an easily accessible format (Tang 1995; Tang 1996).

Why it is important to do this review

Type 2 diabetes mellitus affects a significant proportion of the population in most countries, with an increasing prevalence in industrialised, transition and developing countries, hence making it an important health care issue worldwide.

With the move from hospital- to community-based care in many parts of the world, healthcare professionals need to become increasingly mobile, thus requiring access to data input facilities at the point of care. The gathered information can then be shared with a multi-disciplinary team of physicians, nurses and dieticians to plan a care package for the patient.

There is a need for regular evaluations of CAHTS, analogous to techniques used in continuous quality improvement (Hogan 1997; Poissant 2005). Most of the technologies are at present supported only by face validity and modest or weak empirical evidence. This influences widespread adoption in the management of diabetes and taking of dietary history, hence necessitating more evaluations of CAHTS. Unless these systems are adequately studied, they may not 'mature' to the extent that is needed to realise their full potential when deployed in every-day clinical settings (Auerbach 2007; Grizzle 2007).

Given the social and psychological value ascribed to diet, assessment methodologies used most commonly in epidemiological studies are particularly vulnerable to social desirability bias (a tendency to behave in a way that we believe is socially acceptable and desirable). Some types of CAHTS may contribute to decreasing social desirability bias in patient-reporting of unfavourable behaviours such as potentially harmful dietary habits because it enables data collection without the need for an interviewer (Turner 1998).

Cost-effectiveness and efficiency have rarely been evaluated rigorously (Sidorov 2006), even though computer-assisted history taking systems are frequently promoted as being 'cost-saving' (Chaudhry 2006; Lane 2006). Comprehensive cost-effectiveness analyses will be required to assess the financial rationale for choosing one CAHTS over another history taking tool (Lane 2006; Quinn 2003).

Respondents may leave uncompleted or empty fields (Jaya 2008); there may also be missing data due to technical difficulties (Galliher 2008); there may also be lack of clarification for questions that may not be understood or misunderstood (Jaya 2008). CAHTS may also cause inconvenience to patient and physician and it may also raise fears about privacy and confidentiality (Bowling 2005).

As few randomised controlled trials have been performed in the area of CAHTS so far, it has been speculated that the improvements in the volume and accuracy of the answers seen in studies (Bachman 2003; Benaroya 2007; Farzanfar 2006; Wolford 2008) may not accurately reflect the intervention. It has been suggested that the effects may be attributed to novelty and performance biases whereby the behaviour of researchers and patients was influenced (Dale 2007).

Although computer-assisted history taking systems have been available for around 50 years, successful use in routine healthcare remains variable, particularly in collecting dietary history for diabetes management. This review involves an up-to-date literature search and detailed description of the studies on CAHTS to pro-

vide the framework for a comprehensive evaluation that will lead to an evidence base to inform policy and practice.

OBJECTIVES

- To assess the effects of computer-assisted versus oral-and-written dietary history taking on collected data.
- To assess the effects of computer-assisted versus oral-and-written dietary history taking for managing diabetes mellitus.
- To assess the effects of CAHTS on improvement of dietary habits and better management of blood glucose levels.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials.

Types of participants

We considered studies that included participants aged 16 years or older at the beginning of the study, who were diagnosed with diabetes mellitus. Studies performed on participants suffering from impaired glucose tolerance were not included in this review.

Diagnostic criteria

To be consistent with changes in classification and diagnostic criteria of diabetes mellitus through the years, the diagnosis had to be established using the standard criteria valid at the time of the beginning of the trial (for example ADA 1999; Alberti 1998; WHO 1980; WHO 1985). Ideally, diagnostic criteria should have been described. Where necessary, authors' definition of diabetes mellitus were used. Diagnostic criteria were planned to be subjected to a sensitivity analysis.

Types of interventions

Intervention

We considered all computer-assisted (dietary) history taking systems (CAHTS) for people with diabetes. We considered the following six types of CAHTS (Bowling 2005):

1. Computer-assisted self interviewing

2. Audio computer-assisted self-administered interviewing
3. Computer-assisted face-to-face interviewing
4. Computer-assisted telephone interviewing
5. Interactive voice response telephone interviewing
6. Internet-based computer-assisted history taking

Control

Oral-and-written dietary history taking for people with diabetes

Types of outcome measures

Primary outcomes

- response rates to invitations for dietary assessment for diabetes;
- quality of data (error rates, completeness, accuracy, reliability);
- change in glycosylated haemoglobin A1c level (HbA1c).

Secondary outcomes

- adverse events;
- change in dietary habits (fat and nutrient intake);
- cost-effectiveness;
- patient and provider satisfaction with the methods.

Covariates, effect modifiers and confounders

We anticipated, that patients in the younger age groups (under 45 years old) would be more computer literate than those in older age groups (45 years and older), thus subgroup analyses were planned.

Timing of outcome measurement

Ideally outcomes should be measured at least three months post-intervention to detect a change in HbA1c.

Search methods for identification of studies

Electronic searches

We used the following sources for the identification of trials:

- *The Cochrane Library* (issue 6, 2011);
- MEDLINE (1985 to Week 1 June 2011);
- EMBASE (1980 to June 9 2011);
- CINAHL (1981 to June 9 2011).

We also searched databases of ongoing trials (<http://www.controlled-trials.com/>) with links to several databases.

For detailed search strategies please see [Appendix 2](#).

Additional key words of relevance that were detected during any of the electronic or other searches resulted in modification of electronic search strategies to incorporate these terms. Studies published in any language were included.

Searching other resources

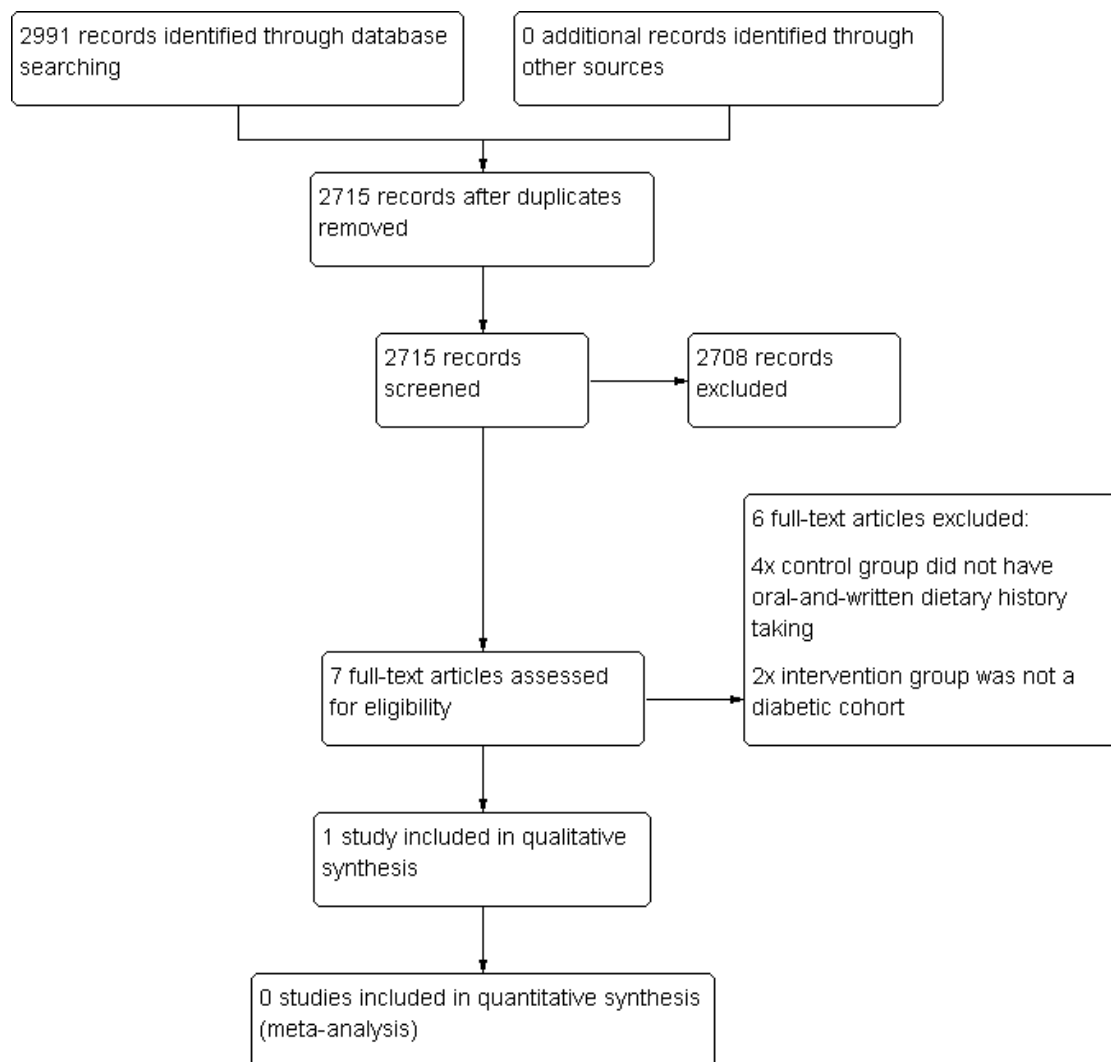
We sought to identify additional studies by searching the reference lists of included trials and (systematic) reviews, meta-analyses and health technology assessment reports.

Data collection and analysis

Selection of studies

To determine the studies to be assessed further, two authors (I.W., Y.P.) independently scanned the abstract, title or both sections of every record retrieved. All potentially relevant articles were investigated as full text. Inter-rater agreement for study selection was planned to be measured using the Kappa statistic ([Cohen 1960](#)). Differences were planned to be marked and if these studies were later on included, the influence of the primary choice was planned to be subjected to a sensitivity analysis. Where differences in opinion existed, they were to be resolved by a third party. If resolving disagreement was not possible, the article would have been added to those 'awaiting assessment' and authors would have been contacted for clarification. An adapted PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow-chart of study selection ([Figure 1](#)) is attached ([Liberati 2009](#)).

Figure 1. Study flow diagram.



Data extraction and management

For studies that fulfilled the inclusion criteria, two authors (I.W., Y.P.) independently abstracted relevant population and intervention characteristics using standard data extraction templates (for details see [Characteristics of included studies](#) and [Table 1](#), [Appendix 3](#), [Appendix 4](#), [Appendix 5](#), [Appendix 6](#)) with any disagreements resolved by discussion, or where required by a third party. Any relevant missing information on the trial was sought from the original author(s) of the article, where required.

Assessment of risk of bias in included studies

Two authors (I.W., Y.P.) assessed each trial and performed assessment of bias independently. Possible disagreement were to be resolved by consensus, or with consultation of a third party in case of disagreement. In cases of disagreement, the rest of the group was to be consulted and a judgement would have been based on consensus.

We assessed risk of bias using the Cochrane Collaboration's tool ([Higgins 2011](#)) of which the following criteria were used:

- random sequence generation (selection bias);
- allocation concealment (selection bias);
- blinding (performance bias and detection bias);
- incomplete outcome data (attrition bias);
- selective reporting (reporting bias);

- other bias.

We judged risk of bias criteria as 'low risk', 'high risk' or 'unclear risk' and used individual bias items as described in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). We planned to assess the impact of individual bias domains on study results at endpoint and study levels.

Measures of treatment effect

Endpoint versus change data: Where possible, endpoint data were presented. If both endpoint and change data were available for the same outcomes, only the former was to be reported in this review. If endpoint data were not available, but change data were, we were to report the change data in the tables and text of the review. However, for inclusion of a study reporting change data in the meta-analysis, we planned to calculate the endpoint mean from the change data given and would have assumed that the endpoint standard deviation was equal to the baseline standard deviation.

Unit of analysis issues

We took into account the level at which randomisation occurred, such as cross-over trials, cluster-randomised trials and multiple observations for the same outcome.

Dealing with missing data

Relevant missing data were obtained from authors, where feasible. Evaluation of important numerical data such as screened, randomised patients as well as intention-to-treat (ITT) and per-protocol (PP) population were to be carefully performed. Attrition rates, for example drop-outs, losses to follow-up and withdrawals were to be investigated. Issues of missing data and techniques to handle these (for example, last-observation-carried-forward (LOCF)) were to be critically appraised.

Assessment of heterogeneity

In the event of substantial clinical or methodological or statistical heterogeneity, study results would not have been combined by means of meta-analysis. Heterogeneity was to be identified by visual inspection of the forest plots, by using a standard χ^2 test and a significance level of $P = 0.1$, in view of the low power of such tests. Heterogeneity was to be specifically examined with the I^2 statistic (Higgins 2002), where an I^2 values of 75% and more indicates a considerable level of heterogeneity (Higgins 2003). When heterogeneity was found, we planned to determine potential reasons for it by examination of individual study and subgroup characteristics.

Assessment of reporting biases

Funnel plots were to be used to assess for the potential existence of small study bias. As a number of explanations for the asymmetry of a funnel plot (Sterne 2001) exist, we planned to carefully interpret results (Lau 2006).

Data synthesis

Data were to be summarised statistically where these were available, sufficiently similar and of sufficient quality. Statistical analysis was to be performed according to the statistical guidelines referenced in the newest version of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011).

Subgroup analysis and investigation of heterogeneity

Subgroup analyses were to be mainly performed if one of the primary outcome parameters demonstrated statistically significant differences between intervention groups. In any other case, subgroup analyses would have been clearly marked as a hypothesis generating exercise.

The following subgroup analyses were planned:

- age (16 to 45 years, older than 45 years);
- socioeconomic profile;
- geographical location (at country level);
- analysis by number of repeated exposures to CAHT interventions;
- year of publication;
- type of CAHT method (self-administered; professional-administered).

Sensitivity analysis

We planned to perform sensitivity analyses in order to explore the influence of the following factors on effect size:

- repeating the analysis excluding unpublished studies;
- repeating the analysis taking account of risk of bias, as specified above;
- repeating the analysis excluding any very long or large studies to establish how much they dominate the results;
- repeating the analysis excluding studies using the following filters: diagnostic criteria, language of publication, source of funding (industry versus other), country.

The robustness of the results was also to be tested by repeating the analysis using different measures of effects size (relative risk, odds ratio etc.) and different statistical models (fixed-effect model and random-effects model).

RESULTS

Description of studies

See: [Characteristics of included studies](#); [Characteristics of excluded studies](#).

Results of the search

A total of 2991 studies were retrieved via electronic database searches ([Figure 1](#)) and imported into EndNote X4 from which 276 duplicates were identified and removed by a combination and sequential use of author name, publication year, title and journal pages and checked manually by the main reviewer. From the remaining 2715 studies, 2708 were screened out prior to the full text stage due to being deemed not relevant to our review. The reasons for exclusion of the studies were as follows: not a diabetic population; no computer-assisted history taking systems (CAHTS) being tested; no dietary history taking; dietary history data were not presented; focused entirely on how to use CAHTS; or the studies were not randomised controlled trials. Upon further review of the seven remaining studies, only one was included ([Probst 2008](#)), see [Characteristics of included studies](#), [Table 1](#), and [Characteristics of excluded studies](#) for details.

Included studies

Only [Probst 2008](#) met our inclusion criteria, the details of which can be found in [Characteristics of included studies](#).

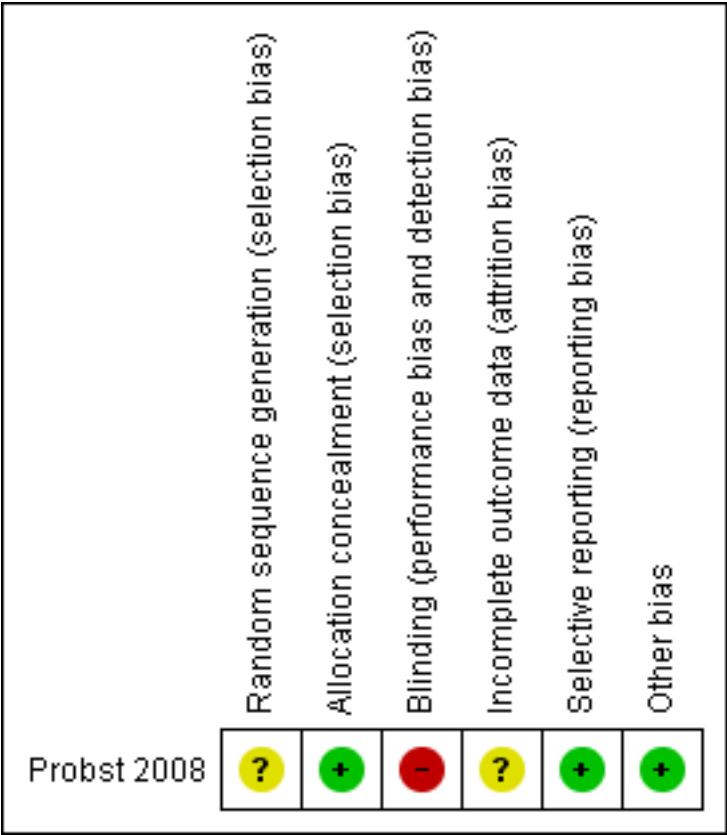
Excluded studies

Elaborating on the brief details provided in the [Characteristics of excluded studies](#) table, [Sevick 2008](#) met most, but not all of our inclusion criteria. [Sevick 2008](#) while a randomised controlled trial of diet history and people with diabetes using a personal digital assistant (PDA), did not employ oral-and-written diet history taking as a control, instead the control group was given general diabetes education. Additionally, primary outcome measures relevant to diabetes have yet to be published, thus providing only usability findings in its current state. [Bakker 2003](#) and [Beasley 2008](#) similarly would have been eligible if study participants had been people with diabetes. [Bakker 2003](#) investigated the differences in interviewer bias between computerized dietary history taking and face-to-face interviews in a healthy population from a Dutch population cohort. [Beasley 2008](#) studied Web pictorial diet history questionnaires in healthy individuals compared to paper-based diet history questionnaires. [Glasgow 2000](#) focused on self-management and counselling for diabetes. Their study mentioned the use of computerized methods to measure fat intake but did not have a control group which had measures taken using oral-and-written methods. [Ralston 2009](#) studied web-based management of diabetes and collected some dietary data using a web application, but did not collect dietary data for their usual care control group.

Risk of bias in included studies

Please see [Characteristics of included studies](#) and [Figure 2](#). Overall, a risk of bias for [Probst 2008](#) likely existed.

Figure 2. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.



Allocation

Probst 2008 did not state how the randomisation process was performed, however allocation was concealed from researchers.

Other potential sources of bias

No other sources of bias were identified.

Blinding

No other mention of blinding was made by Probst 2008.

Effects of interventions

The initial response rate to invitations to the study (Probst 2008) was 92 of 105 eligible patients (92.6%) with 43 returned signed consent forms with variable quality of data. HbA1c was not measured by the study team and no adverse events were reported. Probst 2008 found that reported fat intake for the cross-over groups decreased when seeing the dietitian and increased when queried by the computer, however it was not clear whether the difference was attributable to patients being more honest when queried by a computer as suggested by Turner 1998, or whether they over-reported due to the greater visibility of available food on the web site. It was also found that patients became more familiar with each encounter with the computer-assisted history taking method which resulted in a higher correlation between intervention patients' food records and their computer assessments. As

Incomplete outcome data

While the majority of incomplete outcome data were addressed, Probst 2008 did not address from which groups the losses to follow-up originated by week eight. Only details for week two were provided.

Selective reporting

No selective reporting was detected.

computerised assessments were self-administered by patients, their use was suggested to increase the time physicians may have available to spend with their patients to discuss their diet as opposed to taking measurements. This suggestion is in line with studies from [Benaroya 2007](#) and [Wolford 2008](#). Data on cost-effectiveness and patient and provider satisfaction were not collected. The effect of the intervention on the management of diabetes mellitus was not reported.

DISCUSSION

Summary of main results

Our comprehensive search strategy yielded 2991 studies, of which one met our inclusion criteria ([Probst 2008](#)). Via a context-based RCT, authors tested repeatability and relative validity of a computerised and interviewer-administered assessment. Thirty-eight adults with type 2 diabetes mellitus were randomised into four groups to complete computerised and interviewer-administered dietary assessments ([Table 1](#)). The stated aim of the study was to investigate the relative validity and repeatability of the computer-assisted intervention (self-administered) compared to dietitian administered dietary history, which was confirmed. While there were several differences between the dietary outcomes of the intervention and control groups, most of these were not found to be statistically significant, suggesting that self-administered dietary history taking whilst not greatly improving diet, was as effective as interviewer-administered oral-and-written dietary history taking. The relative validity for fat intake measured between week 0 and week 2 in particular correlated better with self-administered computer-assisted methods as opposed to the oral-and-written one, suggesting that computer-assisted dietary history taking may potentially be more accurate in extracting patient dietary intake. Implementing self-administered history taking in primary care has been suggested to increase available physician time by and therefore reduce waiting times ([Benaroya 2007](#); [Wolford 2008](#)), while [Probst 2008](#) also determined this to be the case, the data have not been published as part of the study, and we can therefore not verify this.

Overall completeness and applicability of evidence

With one study meeting the inclusion criteria ([Probst 2008](#)), we did not gather sufficient evidence to address all of the objectives of the review. We reported on secondary patient outcomes as indicated in our protocol.

Quality of the evidence

With one study meeting the inclusion criteria ([Probst 2008](#)), we are not in a position to make robust conclusions regarding the use of computer-assisted history taking systems for dietary history in comparison to oral-and-written systems.

Agreements and disagreements with other studies or reviews

There are no published reviews on the use of computer-assisted history taking systems (CAHTS) for collection of dietary data for people with diabetes. Although a number of other studies ([Bakker 2003](#); [Beasley 2008](#); [Burke 2005](#); [Ralston 2009](#); [Sevick 2008](#)) reported on dietary history taking using CAHTS, these either did not compare to oral-and-written history taking process for the control group or were not conducted in a population consisting of people with diabetes. The control groups tended to receive general education ([Glasgow 2000](#); [Sevick 2008](#)) or received usual care without history taking ([Ralston 2009](#)).

Relevant studies, which did not meet the inclusion criteria, generally agree that study participants did not object to the use of CAHTS ([Bakker 2003](#); [Beasley 2008](#); [Burke 2005](#); [Sevick 2008](#)). Computer-literacy was sometimes identified as a limiting factor where participants needed to be given additional training in order to complete their tasks correctly ([Sevick 2008](#)). One study compared CAHTS to oral-and-written history methods on a non-diabetic population and found CAHTS to be more accurate and efficient than oral-and-written history both in terms of cost-effectiveness as well as being able to reduce interviewer bias ([Bakker 2003](#)).

A study using person digital assistants (PDAs) for diet history taking in a population with no diabetes found that the method was acceptable to users and high adherence rates in self-monitoring were directly related to meeting participants' set targets ([Burke 2005](#)) - a finding also supported by another study ([Sevick 2008](#)). PDAs were viewed by the researchers, partially based on participant feedback, as less cumbersome due to their user friendly interface and availability of print outs, which illustrated dietary intake and change in weight over time. PDAs were reported as being easier to use by participants than pen and paper ([Tsang 2001](#)). However, initial training and basic knowledge of using computers were helpful in allowing participants to maximise their utility from PDAs - similar to other computer-assisted methods ([Jackson 2006](#); [Probst 2005](#)).

A separate study noted that when entering their diet history into the computer, participants who encountered food items whose consumption was considered to be less socially desirable tended to shift their gaze or posture, which was observed by video recording ([Probst 2009](#)). However, it was not clear whether this would result in a deviation in recorded food intake, especially between entering dietary history into a computer versus interviewer-administered

versions. This may relate to one of the findings from where patients crossing-over from interviewer-administered history taking to self-administered computer-assisted history taking recorded an increase in fat intake and vice versa (Probst 2008). As the computer-assisted version had more comprehensive food listings however, further research with larger sample sizes would be required to confirm or reject this suggestion.

AUTHORS' CONCLUSIONS

Implications for practice

The one included study showed that patients exhibited a familiarity of using computer-assisted history taking systems (CAHTS) that increased with time. The use of CAHTS to gather dietary history from people with diabetes may provide more records and improve monitoring of fat intake (Probst 2005). The effect of CAHTS on the management of diabetes and related clinical outcomes is not reported.

Implications for research

While a variety of computerised dietary assessments exist, they are of variable quality. Only one RCTs met our inclusion criteria. In absence of included studies we are not in a position to make strong suggestions about the direction of future research. However, from reviewing the wider literature, we may infer that RCTs are not the design of choice amongst researcher in the area. Further reviews may extend the list of included type of studies to potentially capture data from interrupted time series and controlled before and after studies.

ACKNOWLEDGEMENTS

Warm thanks to the Metabolic and Endocrine Disorders Group editorial team for their prompt advice and help with designing the search strategy.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Probst 2008

Methods	Context-based randomised controlled trial	
Participants	61.8 ± 9.3 years (41-75) of age, 85 ± 14.7 kg in weight, 55.2% female, type 2 diabetes, majority overweight, patients on database of a medical practice from Illawara region of New South Wales in Australia	
Interventions	Patients allocated in equal numbers (n=10) to 4 groups: Group A had three computerized assessments, group B had three interviewer administered assessments, group C had two computerized and one interviewer administered assessments and group D had two interviewer administered and one computerized assessment Week 0, 2 and 8. Weight data entered during computerised assessments were not checked for validity, while interviewer-assessments measured weight. 3 day food records kept at the start of Week 0 and Week 2, which tested relative validity. Based on results, patients were given dietary prescription to follow for next 6 weeks	
Outcomes	Total energy, total fat, saturated fatty acids, polyunsaturated fatty acids and monounsaturated fatty acids at 2 and 8 weeks	
Stated aim of study	To test repeatability and relative validity of a computerised and interviewer-administered assessment	
Notes	Whilst patients with diabetes were used, clinical outcomes were not measured or published	
<i>Risk of bias</i>		
Bias	Authors’ judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	None stated
Allocation concealment (selection bias)	Low risk	Blinded to researchers at allocation stage
Blinding (performance bias and detection bias) All outcomes	High risk	Communication with author: “Patients were blinded to the first two weeks of the study. When they arrived at the medical centre they were informed whether they would be seeing an ‘actual’ or a ‘virtual’ dietitian.”
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Addressed reasons for loss to follow-up. Outcome data reported. While groups which experienced attrition at week 8 were

Probst 2008 (Continued)

		not identified/specified in the publication, the author provided details in personal communication
Selective reporting (reporting bias)	Low risk	Explained exclusion of one data point
Other bias	Low risk	Satisfied this is so

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Bakker 2003	Study participants not people with diabetes.
Beasley 2008	Study participants not people with diabetes.
Burke 2005	Control group not oral or written history taking.
Glasgow 2000	Control group not oral or written history taking.
Ralston 2009	Control group not oral or written history taking.
Sevick 2008	Control group not oral or written history taking.

DATA AND ANALYSES

This review has no analyses.

ADDITIONAL TABLES

Table 1. Overview of study populations

Character- istic Study ID	Interven- tion(s) & control(s)	[n] screened	[n] randomised	[n] safety	[n] ITT	[n] finishing study	[%] of ran- domised par- ticipants finishing study	Comments
Probst 2008	Group A had three computerized assessments, group B had three interviewer administered assessments, group C had two computerized and one interviewer administered assessments and group D had two interviewer administered and one computerized assessment	Total: 105	A: 10 B: 10 C: 9 D: 9 Total: 38	-	-	A: 9 B: 9 C: 6 D: 7 Total: 31	A: 90% B: 90% C: 66.7% D: 77.8% Total: 81.6%	[n] screened prior to randomisation or assignment to groups defined here as number of patients eligible for study [n] safety and [n] ITT not applicable. Not specified which groups experienced attrition in publication but received from author in personal communication
<i>Total</i>			A: 10 B: 10 C: 9 D: 9 Total: 38			A: 9 B: 9 C: 6 D: 7 Total: 31		

ITT: intention-to-treat

APPENDICES

Appendix 1. Data collection modes

Administration Modes	Onsite	Telephone	Internet
Professional completed	The patient is present onsite with a health physician who facilitates the history-taking process with a technological system (audio presentation, oral, keyed input)	The patient responds to a telephone interview by a health physician who records the responses (audio presentation, oral, keyed input)	N/A
Patient completed	The patient is present onsite and conducts the history by himself/herself through a technological system, such as laptop, desktop computer, or PDA (audio & visual presentation, keyed input)	The patient responds to an automated telephone system that records the responses for access by a health physician (audio presentation, keyed input)	The patient is given access to an online survey to complete, which can then be accessed by a health physician and linked to other similar patient records (visual & audio presentation, keyed input)
<i>Footnotes</i> N/A: not acknowledged; PDA: personal digital assistant			

Appendix 2. Search strategies

Search terms
<p>Unless otherwise stated, search terms are free text terms; MeSH = Medical subject heading (Medline medical index term); exp = exploded MeSH; the dollar sign (\$) or asterisk (*) stand for any character(s); the question mark (?) substitutes for one or no characters; ab = abstract; adj = adjacent; ot = original title; pt = publication type; rn = Registry number or Enzyme Commission number; sh = MeSH; ti = title; tw = text word</p> <p>The Cochrane Library</p> <p>#1 MeSH descriptor Diabetes mellitus explode all trees</p> <p>#2 diabet* in All Text</p> <p>#3 (IDDM in All Text or NIDDM in All Text or MODY in All Text)</p> <p>#4 (late in All Text and (onset in All Text near/6 diabet* in All Text))</p> <p>#5 (maturity in All Text and (onset in All Text near/6 diabet* in All Text))</p> <p>#6 (syndrom in All Text and (X in All Text near/6 diabet* in All Text))</p> <p>#7 (hyperinsulin* in All Text or (insulin in All Text and sensitiv* in All Text))</p> <p>#8 (insulin* in All Text and secret in All Text and dysfunction* in All Text)</p> <p>#9 (impaired in All Text and glucose in All Text and toleran* in All Text)</p> <p>#10 (glucose in All Text and intoleran* in All Text)</p> <p>#11 MeSH descriptor Glucose Intolerance explode all trees</p> <p>#12 (insulin* in All Text and resist* in All Text)</p> <p>#13 ((non in All Text and insulin* in All Text and depend* in All Text) or (noninsulin* in All Text and depend* in All Text) or (non</p>

(Continued)

in All Text and insulin?depend* in All Text) or noninsulin?depend* in All Text)
#14 MeSH descriptor Insulin resistance explode all trees
#15 ((insulin* in All Text and depend* in All Text) or insulin?depend* in All Text)
#16 (#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15)
#17 MeSH descriptor Diabetes insipidus explode all trees
#18 (diabet\$ in All Text and insipidus in All Text)
#19 (#17 or #18)
#20 (#16 and not #19)
#21 MeSH descriptor Medical History Taking explode all trees
#22 MeSH descriptor Automatic Data processing explode all trees
#23 MeSH descriptor Data collection explode all trees with qualifiers: MT,ST,TD,IS
#24 MeSH descriptor Decision support techniques explode all trees
#25 MeSH descriptor Decision Making, computer-assisted explode all trees
#26 MeSH descriptor Computer-assisted instruction explode all trees
#27 MeSH descriptor Therapy, computer-assisted explode all trees
#28 MeSH descriptor Diagnosis, computer-assisted explode all trees
#29 MeSH descriptor Medical informatics explode all trees
#30 MeSH descriptor Telemedicine explode all trees
#31 MeSH descriptor Remote consultation explode all trees
#32 MeSH descriptor Questionnaires explode all trees with qualifiers: ST,MT,TD
#33 MeSH descriptor Interviews as topic explode all trees with qualifiers: ST,MT,PX
#34 MeSH descriptor Medical records systems, computerized explode all trees
#35 MeSH descriptor Computers explode all trees
#36 ((computer* in All Text near/6 histor* in All Text) or ((computer* in All Text near/6 data in All Text) and collection* in All Text) or (computer* in All Text near/6 screen* in All Text) or (computer* in All Text near/6 interview* in All Text) or (computer* in All Text near/6 inventor* in All Text))
#37 ((Computer* in All Text near/6 anamnes* in All Text) or (Computer* in All Text near/6 questionnaire* in All Text) or (computer* in All Text near/6 assessment* in All Text) or (computer* in All Text near/6 consult* in All Text))
#38 ((electronic in All Text near/6 histor* in All Text) or ((electronic in All Text near/6 data in All Text) and collection* in All Text) or (electronic in All Text near/6 screen* in All Text) or (electronic in All Text near/6 interview* in All Text) or (electronic in All Text near/6 inventor* in All Text))
#39 ((electronic in All Text near/6 anamnes* in All Text) or (electronic in All Text near/6 questionnaire* in All Text) or (electronic* in All Text near/6 assessment* in All Text) or (electronic in All Text near/6 consult* in All Text))
#40 ((online in All Text near/6 histor* in All Text) or ((online in All Text near/6 data in All Text) and collection* in All Text) or (online in All Text near/6 screen* in All Text) or (online in All Text near/6 interview* in All Text) or (online in All Text near/6 inventor* in All Text))
#41 ((online in All Text near/6 anamnes* in All Text) or (online in All Text near/6 questionnaire* in All Text) or (online in All Text near/6 assessment* in All Text) or (online in All Text near/6 consult* in All Text))
#42 ((on-line in All Text near/6 histor* in All Text) or ((on-line in All Text near/6 data in All Text) and collection* in All Text) or (on-line in All Text near/6 screen* in All Text) or (on-line in All Text near/6 interview* in All Text) or (on-line in All Text near/6 inventor* in All Text))
#43 ((on-line in All Text near/6 anamnes* in All Text) or (on-line in All Text near/6 questionnaire* in All Text) or (on-line in All Text near/6 assessment* in All Text) or (on-line in All Text near/6 consult* in All Text))
#44 ((automated in All Text near/6 histor* in All Text) or ((automated in All Text near/6 data in All Text) and collection* in All Text) or (automated in All Text near/6 screen* in All Text) or (automated in All Text near/6 interview* in All Text) or (automated in All Text near/6 inventor* in All Text))
#45 ((automated in All Text near/6 anamnes* in All Text) or (automated in All Text near/6 questionnaire* in All Text) or (automated in All Text near/6 assessment* in All Text) or (automated in All Text near/6 consult* in All Text))
#46 ((web in All Text near/6 histor* in All Text) or ((web in All Text near/6 data in All Text) and collection* in All Text) or (web

(Continued)

in All Text near/6 screen* in All Text) or (web in All Text near/6 interview* in All Text) or (web in All Text near/6 inventor* in All Text))
#47 ((web in All Text near/6 anamnes* in All Text) or (web in All Text near/6 questionnaire* in All Text) or (web in All Text near/6 assessment* in All Text) or (web in All Text near/6 consult* in All Text))
#48 ((internet in All Text near/6 histor* in All Text) or ((internet in All Text near/6 data in All Text) and collection* in All Text) or (internet in All Text near/6 screen* in All Text) or (internet in All Text near/6 interview* in All Text) or (internet in All Text near/6 inventor* in All Text))
#49 ((internet in All Text near/6 anamnes* in All Text) or (internet in All Text near/6 questionnaire* in All Text) or (internet in All Text near/6 assessment* in All Text) or (internet in All Text near/6 consult* in All Text))
#50 ((telephon* in All Text near/6 interview* in All Text) or (telephon* in All Text near/6 inventor* in All Text) or (telephon* in All Text near/6 consult* in All Text))
#51 ((face-to-face in All Text near/6 interview* in All Text) or (face-to-face in All Text near/6 inventor* in All Text) or (face-to-face in All Text near/6 consult* in All Text))
#52 (FFQ in All Text or (personal in All Text and digital in All Text and assistant* in All Text))
#53 (acasi in All Text or casi in All Text or cati in All Text or cafi in All Text or ivti in All Text or kiosk* in All Text)
#54 (#21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40)
#55 (#41 or #42 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53)
#56 (#54 or #55)
#57 (#20 and #56)
#58 MeSH descriptor Diet explode all trees
#59 MeSH descriptor Family explode all trees
#60 ((family in All Text and history in All Text) or diet in All Text or screen* in All Text)
#61 (#58 or #59 or #60)
#62 (#57 and #61)

MEDLINE

1. exp Diabetes Mellitus/
2. diabet\$.tw,ot.
3. (IDDM or NIDDM or MODY or T1DM or T2DM or T1D or T2D).tw,ot.
4. (non insulin\$ depend\$ or noninsulin\$ depend\$ or non insulin?depend\$ or noninsulin?depend\$).tw,ot.
5. (insulin\$ depend\$ or insulin?depend\$).tw,ot.
6. exp Diabetes Insipidus/
7. diabet\$ insipidus.tw,ot.
8. or/1-5
9. 6 or 7
10. 8 not 9
11. exp Medical History Taking/
12. exp Automatic Data Processing/
13. exp Data Collection/mt, st, td, is [Methods, Standards, Trends, Instrumentation]
14. exp Decision Support Techniques/
15. exp Decision Making, Computer-Assisted/
16. exp Computer-Assisted Instruction/
17. exp Therapy, Computer-Assisted/
18. exp Medical Informatics/
19. exp Telemedicine/
20. exp Remote Consultation/
21. exp Questionnaires/st, mt, td
22. exp Interviews as topic/px, mt, st

(Continued)

23. exp Medical records systems, computerized/
24. exp Computers/ or exp Computers, Handheld/
25. (computer* adj6 (histor* or data collection* or screen* or interview* or inventor* or anamnes* or questionnaire* or assessment* or consult*)).tw,ot.
26. (electronic adj6 (histor* or data collection* or screen* or interview* or inventor* or anamnes* or questionnaire* or assessment* or consult*)).tw,ot.
27. ((online or on-line) adj6 (histor* or data collection* or screen* or interview* or inventor* or anamnes* or questionnaire* or assessment* or consult*)).tw,ot.
28. (automated adj6 (histor* or data collection* or screen* or interview* or inventor* or anamnes* or questionnaire* or assessment* or consult*)).tw,ot.
29. (web adj6 (histor* or data collection* or screen* or interview* or inventor* or anamnes* or questionnaire* or assessment* or consult*)).tw,ot.
30. (internet adj6 (histor* or data collection* or screen* or interview* or inventor* or anamnes* or questionnaire* or assessment* or consult*)).tw,ot.
31. (tablet* adj6 (histor* or data collection* or screen* or interview* or questionnaire* or assessment* or consult*)).tw,ot.
32. ((touchscreen* or touch screen*) adj6 (histor* or data collection* or screen* or interview* or questionnaire* or assessment*)).tw,ot.
33. ((telephon* or telefon* or face-to-face) adj6 (interview* or inventor* or consult*)).tw,ot.
34. (FFQ or personal digital assistant*).tw,ot.
35. (acasi or casi or cati or cafi or ivti or kiosk*).tw,ot.
36. or/11-35
37. Diet/ or exp Diabetic Diet/ or exp Diet, Carbohydrate-Restricted/ or exp Diet, Atherogenic/ or exp Diet Therapy/
38. diet.tw,ot.
39. exp Family/
40. exp Mass Screening/is, mt, td, st [Instrumentation, Methods, Trends, Standards]
41. (family history or screen* or anamnes*).tw,ot.
42. or/37-41
43. randomized controlled trial.pt.
44. controlled clinical trial.pt.
45. randomi?ed.ab.
46. placebo.ab.
47. drug therapy.fs.
48. randomly.ab.
49. trial.ab.
50. groups.ab.
51. or/43-50
52. Meta-analysis.pt.
53. exp Technology Assessment, Biomedical/
54. exp Meta-analysis/
55. exp Meta-analysis as topic/
56. hta.tw,ot.
57. (health technology adj6 assessment\$).tw,ot.
58. (meta analy\$ or metaanaly\$ or meta?analy\$).tw,ot.
59. ((review\$ or search\$) adj10 (literature\$ or medical database\$ or medline or pubmed or embase or cochrane or cinahl or psycinfo or psyclit or healthstar or biosis or current content\$ or systemat\$)).tw,ot.
60. or/52-59
61. 51 or 60
62. (comment or editorial or historical-article).pt.
63. 61 not 62

(Continued)

- 64. 10 and 36 and 42 and 63
- 65. (animals not (animals and humans)).sh.
- 66. 64 not 65

EMBASE

- 1. exp Diabetes Mellitus/
- 2. diabet\$.tw,ot.
- 3. (non insulin* depend* or noninsulin* depend* or non insulin?depend* or noninsulin?depend*).tw,ot.
- 4. (insulin* depend* or insulin?depend*).tw,ot.
- 5. (IDDM or NIDDM or MODY or T1DM or T2DM or T1d or T2D).tw,ot.
- 6. or/1-5
- 7. exp Diabetes Insipidus/
- 8. diabet* insipidus.tw,ot.
- 9. 7 or 8
- 10. 6 not 9
- 11. *information processing/
- 12. exp decision support system/
- 13. exp computer assisted therapy/
- 14. exp computer assisted diagnosis/
- 15. exp automation/ or exp "automation, computers and data processing"/
- 16. exp computer analysis/ or exp computer program/ or exp computer simulation/ or exp electronic data interchange/ or exp human computer interaction/
- 17. exp telecommunication/
- 18. exp telemedicine/
- 19. exp teleconsultation/
- 20. exp computer interface/
- 21. *questionnaire/ or exp open-ended questionnaire/ or exp structured questionnaire/
- 22. exp electronic medical record/
- 23. exp microcomputer/
- 24. (computer* adj6 (histor* or data collection* or screen* or interview* or inventor* or anamnes* or questionnaire* or assessment* or consult*)).tw,ot.
- 25. ((online or on-line) adj6 (histor* or data collection* or screen* or interview* or inventor* or anamnes* or questionnaire* or assessment* or consult*)).tw,ot.
- 26. (electronic adj6 (histor* or data collection* or screen* or interview* or inventor* or anamnes* or questionnaire* or assessment* or consult*)).tw,ot.
- 27. (automated adj6 (histor* or data collection* or screen* or interview* or inventor* or anamnes* or questionnaire* or assessment* or consult*)).tw,ot.
- 28. (web adj6 (histor* or data collection* or screen* or interview* or inventor* or anamnes* or questionnaire* or assessment* or consult*)).tw,ot.
- 29. (internet adj6 (histor* or data collection* or screen* or interview* or inventor* or anamnes* or questionnaire* or assessment* or consult*)).tw,ot.
- 30. ((telephon* or telefon* or face-to-face) adj6 (interview* or inventor* or consult*)).tw,ot.
- 31. (FFQ or personal digital assistant*).tw,ot.
- 32. (acasi or casi or cati or cafi or ivti or kiosk*).tw,ot.
- 33. (tablet* adj6 (histor* or data collection* or screen* or interview* or questionnaire* or assessment* or consult*)).tw,ot.
- 34. ((touchscreen* or touch screen*) adj6 (histor* or data collection* or screen* or interview* or questionnaire* or assessment*)).tw,ot.
- 35. exp personal digital assistant/
- 36. or/11-35

(Continued)

37. exp diet/
38. exp diabetic diet/ or exp low carbohydrate diet/ or exp diet restriction/ or exp low calory diet/ or exp diet therapy/
39. diet*.tw,ot.
40. exp family history/
41. exp mass screening/
42. (family history or history tak* or anamnes* or screen*).tw,ot.
43. or/37-42
44. exp Randomized Controlled Trial/
45. exp Controlled Clinical Trial/
46. exp Clinical Trial/
47. exp Comparative Study/
48. exp Drug comparison/
49. exp Randomization/
50. exp Crossover procedure/
51. exp Double blind procedure/
52. exp Single blind procedure/
53. exp Placebo/
54. exp Prospective Study/
55. ((clinical or control\$ or comparativ\$ or placebo\$ or prospectiv\$ or randomi?ed) adj3 (trial\$ or stud\$)).ab,ti.
56. (random\$ adj6 (allocat\$ or assign\$ or basis or order\$)).ab,ti.
57. ((singl\$ or doubl\$ or trebl\$ or tripl\$) adj6 (blind\$ or mask\$)).ab,ti.
58. (cross over or crossover).ab,ti.
59. or/44-58
60. exp meta analysis/
61. (metaanaly\$ or meta analy\$ or meta?analy\$).ab,ti,ot.
62. (systematic adj3 review*).tw,ot.
63. exp Literature/
64. exp Biomedical Technology Assessment/
65. hta.tw,ot.
66. (health technology adj6 assessment\$).tw,ot.
67. or/60-66
68. 59 or 67
69. (comment or editorial or historical-article).pt.
70. 68 not 69
71. 10 and 36 and 43 and 70

CINAHL

1. mh diabetes mellitus+
2. TI diabet* or AB diabet*
3. TI (IDDM OR NIDDM OR MODY OR T1DM OR T2DM OR T1D OR T2D) or ab (IDDM OR NIDDM OR MODY OR T1DM OR T2DM OR T1D OR T2D)
4. TI (non insulin* depend* OR noninsulin* depend* OR non insulin*depend* OR noninsulin*depend*) or AB (non insulin* depend* OR noninsulin* depend* OR non insulin*depend* OR noninsulin*depend*)
5. TI (insulin* depend* OR insulin*depend*) or AB (insulin* depend* OR insulin*depend*)
6. mh diabetes insipidus+
7. TI (diabet* AND insipidus) or AB (diabet* AND insipidus)
8. S1 or S2 or S3 or S4 or S5
9. S6 or S7
10. S8 NOT S9
11. mh patient history taking+

(Continued)

12. mh PATIENT RECORD SYSTEMS+
13. mh MEDICAL RECORDS+
14. mh INTERVIEWS+/MT
15. mh QUESTIONNAIRES+/mt
16. mh REMOTE CONSULTATION+
17. mh DIAGNOSIS, COMPUTER ASSISTED+
18. mh DECISION MAKING, COMPUTER ASSISTED+
19. exp DATA COLLECTION, COMPUTER ASSISTED+
20. mh MEDICAL INFORMATICS+
21. mh TELEMEDICINE+
22. (MH "Computers and Computerization+") or (mh "COMPUTERS, PORTABLE+")
23. TI ((computer* N6 histor*) OR (computer* N6 data collection*) OR (computer* N6 screen*) OR (computer* N6 interview*) OR (computer* N6 inventor*) OR (computer* N6 anamnes*) OR (computer* N6 questionnaire*) OR (computer* N6 assessment*) OR (computer* N6 consult*)) OR AB ((computer* N6 histor*) OR (computer* N6 data collection*) OR (computer* N6 screen*) OR (computer* N6 interview*) OR (computer* N6 inventor*) OR (computer* N6 anamnes*) OR (computer* N6 questionnaire*) OR (computer* N6 assessment*) OR (computer* N6 consult*))
24. TI ((electronic N6 histor*) OR (electronic N6 data collection*) OR (electronic N6 screen*) OR (electronic N6 interview*) OR (electronic N6 inventor*) OR (electronic N6 anamnes*) OR (electronic N6 questionnaire*) OR (electronic N6 assessment*) OR (electronic N6 consult*)) OR AB ((electronic N6 histor*) OR (electronic N6 data collection*) OR (electronic N6 screen*) OR (electronic N6 interview*) OR (electronic N6 inventor*) OR (electronic N6 anamnes*) OR (electronic N6 questionnaire*) OR (electronic N6 assessment*) OR (electronic N6 consult*))
25. TI ((online N6 histor*) OR (online N6 data collection*) OR (online N6 screen*) OR (online N6 interview*) OR (online N6 inventor*) OR (online N6 anamnes*) OR (online N6 questionnaire*) OR (online N6 assessment*) OR (online N6 consult*)) OR AB ((online N6 histor*) OR (online N6 data collection*) OR (online N6 screen*) OR (online N6 interview*) OR (online N6 inventor*) OR (online N6 anamnes*) OR (online N6 questionnaire*) OR (online N6 assessment*) OR (online N6 consult*))
26. TI ((on-line N6 histor*) OR (on-line N6 data collection*) OR (on-line N6 screen*) OR (on-line N6 interview*) OR (on-line N6 inventor*) OR (on-line N6 anamnes*) OR (on-line N6 questionnaire*) OR (on-line N6 assessment*) OR (on-line N6 consult*)) OR AB ((on-line N6 histor*) OR (on-line N6 data collection*) OR (on-line N6 screen*) OR (on-line N6 interview*) OR (on-line N6 inventor*) OR (on-line N6 anamnes*) OR (on-line N6 questionnaire*) OR (on-line N6 assessment*) OR (on-line N6 consult*))
27. TI ((automated N6 histor*) OR (automated N6 data collection*) OR (automated N6 screen*) OR (automated N6 interview*) OR (automated N6 inventor*) OR (automated N6 anamnes*) OR (automated N6 questionnaire*) OR (automated N6 assessment*) OR (automated N6 consult*)) OR AB ((automated N6 histor*) OR (automated N6 data collection*) OR (automated N6 screen*) OR (automated N6 interview*) OR (automated N6 inventor*) OR (automated N6 anamnes*) OR (automated N6 questionnaire*) OR (automated N6 assessment*) OR (automated N6 consult*))
28. TI ((web N6 histor*) OR (web N6 data collection*) OR (web N6 screen*) OR (web N6 interview*) OR (web N6 inventor*) OR (web N6 anamnes*) OR (web N6 questionnaire*) OR (web N6 assessment*) OR (web N6 consult*)) OR AB ((web N6 histor*) OR (web N6 data collection*) OR (web N6 screen*) OR (web N6 interview*) OR (web N6 inventor*) OR (web N6 anamnes*) OR (web N6 questionnaire*) OR (web N6 assessment*) OR (web N6 consult*))
29. TI ((internet N6 histor*) OR (internet N6 data collection*) OR (internet N6 screen*) OR (internet N6 interview*) OR (internet N6 inventor*) OR (internet N6 anamnes*) OR (internet N6 questionnaire*) OR (internet N6 assessment*) OR (internet N6 consult*)) OR AB ((internet N6 histor*) OR (internet N6 data collection*) OR (internet N6 screen*) OR (internet N6 interview*) OR (internet N6 inventor*) OR (internet N6 anamnes*) OR (internet N6 questionnaire*) OR (internet N6 assessment*) OR (internet N6 consult*))
30. TI ((tablet N6 histor*) OR (tablet N6 data collection*) OR (tablet N6 screen*) OR (tablet N6 interview*) OR (tablet N6 questionnaire*) OR (tablet N6 assessment*) OR (tablet N6 consult*)) OR AB ((tablet N6 histor*) OR (tablet N6 data collection*) OR (tablet N6 screen*) OR (tablet N6 interview*) OR (tablet N6 questionnaire*) OR (tablet N6 assessment*) OR (tablet N6 consult*))
31. TI ((touchscreen N6 histor*) OR (touchscreen N6 data collection*) OR (touchscreen N6 screen*) OR (touchscreen N6 interview*) OR (touchscreen N6 questionnaire*) OR (touchscreen N6 assessment*)) OR AB ((touchscreen N6 histor*) OR (touchscreen N6 data collection*) OR (touchscreen N6 screen*) OR (touchscreen N6 interview*) OR (touchscreen N6 questionnaire*) OR (touchscreen

(Continued)

N6 assessment*))

32. TI ((touch screen N6 histor*) OR (touch screen N6 data collection*) OR (touch screen N6 screen*) OR (touch screen N6 interview*) OR (touch screen N6 questionnaire*) OR (touch screen N6 assessment*)) OR AB ((touch screen N6 histor*) OR (touch screen N6 data collection*) OR (touch screen N6 screen*) OR (touch screen N6 interview*) OR (touch screen N6 questionnaire*) OR (touch screen N6 assessment*))

33. TI ((telephon* N6 interview*) OR (telephon* N6 inventor*) OR (telephon* N6 consult*)) OR AB ((telephon* N6 interview*) OR (telephon* N6 inventor*) OR (telephon* N6 consult*))

34. TI ((face-to-face N6 interview*) OR (face-to-face N6 inventor*) OR (face-to-face N6 consult*)) OR AB ((face-to-face N6 interview*) OR (face-to-face N6 inventor*) OR (face-to-face N6 consult*))

35. TI (FFQ or personal digital assistant) OR AB (FFQ or personal digital assistant)

36. TI (acasi or casi or cati or cafi or ivti or kiosk*) OR AB (acasi or casi or cati or cafi or ivti or kiosk*)

37. S11 or S12 or S13 or S14 or S15 or S16 or S17 or S18 or S19 or S20 or S21 or S22 or S23 or S24 or S25 or S26 or S27 or S28 or S29 or S30 or S31 or S32 or S33 or S34 or S35 or S36

38. mh diet+ or mh diet therapy+

39. TI diet OR AB diet

40. mh family+

41. mh health screening+/mt

42. TI (family history or screen* or anamnes*) OR AB (family history or screen* or anamnes*)

43. S38 or S39 or S40 or S41 or S42

44. (MH "Clinical Trials+")

45. (MH "Comparative Studies")

46. (MH "Random Assignment")

47. (MH "Placebos")

48. (MH "Prospective Studies+")

49. AB ((trial* N3 clinical) OR (trial* N3 control*) OR (trial* N3 comparative) OR (trial* N3 placebo) OR (trial* N3 prospective) OR (trial* N3 randomi?ed)) OR TI ((trial* N3 clinical) OR (trial* N3 control*) OR (trial* N3 comparative) OR (trial* N3 placebo) OR (trial* N3 prospective) OR (trial* N3 randomi?ed))

50. AB ((stud* N3 clinical) OR (stud* N3 control*) OR (stud* N3 comparative) OR (stud* N3 placebo) OR (stud* N3 prospective) OR (stud* N3 randomi?ed)) OR TI ((stud* N3 clinical) OR (stud* N3 control*) OR (stud* N3 comparative) OR (stud* N3 placebo) OR (stud* N3 prospective) OR (stud* N3 randomi?ed))

51. TI ((random* N6 allocat*) OR (random* N6 assign*) OR (random* N6 basis*) OR (random* N6 order*)) OR AB ((random* N6 allocat*) OR (random* N6 assign*) OR (random* N6 basis*) OR (random* N6 order*))

52. TI ((blind* N6 single) OR (blind* N6 double) OR (blind* N6 triple)) OR AB ((blind* N6 single) OR (blind* N6 double) OR (blind* N6 triple))

53. TI ((mask* N6 single) OR (mask* N6 double) OR (mask* N6 triple)) OR AB ((mask* N6 single) OR (mask* N6 double) OR (mask* N6 triple))

54. TI (crossover or cross over) OR AB (crossover or cross over)

55. S44 or S45 or S46 or S47 or S48 or S49 or S50 or S51 or S52 or S53 or S54

56. (MH "Meta Analysis")

57. TI (metaanaly* OR meta analy* OR meta?analy*) OR AB (metaanaly* OR meta analy* OR meta?analy*)

58. TI (systematic* N3 review*) OR AB (systematic* N3 review*)

59. TI (hta) or AB (hta)

60. TI (health technology N6 assess*) OR AB (health technology N6 assess*)

61. S56 or S57 or S58 or S59 or S60

62. S55 or S61

63. PT (comment OR editorial OR historical-article)

64. S62 NOT S63

65. S10 and S37 and S43 and S64

Appendix 3. Description of interventions

Study ID Characteristic	Probst 2008
Intervention(s) and control(s)	A: Computerised assessment at 0, 2 and 8 weeks B: Interviewer assessment at 0, 2 and 8 weeks. C: Computerised assessment at 0 and 2 weeks and interviewer assessment at 8 weeks D: Interviewer assessment at 0 and 2 weeks and computerised assessment at 8 weeks

Appendix 4. Baseline characteristics

Study ID Characteristic	Probst 2008
Intervention(s) & control(s)	A: Computerised assessment at 0, 2 and 8 weeks B: Interviewer assessment at 0, 2 and 8 weeks. C: Computerised assessment at 0 and 2 weeks and interviewer assessment at 8 weeks D: Interviewer assessment at 0 and 2 weeks and computerised assessment at 8 weeks
Participating population	Patients of an Illawarra medical practice with diabetes mellitus
Sex [female% / male%]	55.2 / 44.8
Age [mean years (SD)/range]	61.3 (range 41-75)
Duration of disease [mean years (SD)]	not provided
HbA1c [mean % (SD)]	not provided
BMI [mean kg/m ² (SD)]	30 (4.6)
Ethnic groups [%]	not provided
Duration of intervention	3 sessions
Duration of follow up	8 weeks
<i>Footnotes</i> BMI: body mass index; HbA1c: glycosylated haemoglobin A1c	

Appendix 5. Matrix of study endpoints

Study ID Characteristic	Probst 2008
Intervention(s) & control(s)	A: Computerised assessment at 0, 2 and 8 weeks B: Interviewer assessment at 0, 2 and 8 weeks. C: Computerised assessment at 0 and 2 weeks and interviewer assessment at 8 weeks D: Interviewer assessment at 0 and 2 weeks and computerised assessment at 8 weeks
Primary ¹ endpoint(s)	First endpoint at week 2 to assess relative validity Second endpoint at week 8 to assess dietary change
Secondary ² endpoint(s)	
Other ³ endpoint(s)	Total energy, total fat, saturated fatty acids, polyunsaturated fatty acids and monounsaturated fatty acids at 2 and 8 weeks
<i>Footnotes</i> ^{1,2} as stated in the publication; ³ not stated as primary or secondary endpoint(s) in the publication	

Appendix 6. Adverse events

Study ID Characteristic	Probst 2008
Intervention(s) & control(s)	A: Computerised assessment at 0, 2 and 8 weeks B: Interviewer assessment at 0, 2 and 8 weeks. C: Computerised assessment at 0 and 2 weeks and interviewer assessment at 8 weeks D: Interviewer assessment at 0 and 2 weeks and computerised assessment at 8 weeks
Deaths [n]	All: 0
Adverse events [n / %]	All: 0
Serious adverse events [n / %]	All: 0
Drop-outs due to adverse events [n / %]	All: 0
Symptoms [n / %]	All: 0

CONTRIBUTIONS OF AUTHORS

IGOR WEI: Designed the search strategy, acted as first reviewer and wrote the review.

YANNIS PAPPAS: Wrote the protocol, acted as second reviewer and supervised IW.

JOSIP CAR: Conceived the idea for the review and contributed to writing.

AZIZ SHEIKH: Supervised the research and contributed to the editing of the review.

AZEEM MAJEED: Supervised the research and contributed to the editing of the review.

DECLARATIONS OF INTEREST

This report is independent research commissioned by the NHS Connecting for Health Evaluation Programme (NHS CFHEP 001). The views expressed in this publication are those of the authors and not necessarily those of the NHS, the NHS Connecting for Health Evaluation Programme, or the Department of Health.

SOURCES OF SUPPORT

Internal sources

- eHealth Unit, Department of Primary Care and Public Health, Imperial College London, UK.
JC, YP, IW and AM received salary and office space
- Centre of Population Health Sciences, The University of Edinburgh, UK.
AS received salary and office space

External sources

- NHS CFHEP 001, UK.
The Department of Primary Care & Public Health at Imperial College London is grateful for support from the NHS Connecting for Health Scheme.
- NIHR CLAHRC, UK.
The Department of Primary Care & Public Health at Imperial College London is grateful for support from the NIHR Collaboration for Leadership in Applied Health Research & Care (CLAHRC) Scheme
- NIHR BRC, UK.
The Department of Primary Care & Public Health at Imperial College London is grateful for support from the NIHR Biomedical Research Centre scheme

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

Added “change in dietary habits (fat and nutrient intake)” to secondary outcomes

INDEX TERMS

Medical Subject Headings (MeSH)

*Diabetes Mellitus [blood; therapy]; *Diet Records; *Medical Records Systems, Computerized; Hemoglobin A, Glycosylated [analysis]; Medical History Taking [*methods]

MeSH check words

Humans